

VATERIA, L. (*Dipterocarpeæ*).

In the 'Prod. Fl. Penins. Ind. Or.' i. p. 84, Dr. Wight and I pointed out how *V. lanceolata* of Roxburgh differed from the original species of the genus. Our remarks have been lately confirmed by the discovery of another species allied to, but distinct from *V. lanceolata*. I shall here therefore divide the genus into two sections or subgenera.

I. EUVATERIA.

Calycis lacinia obtusæ, fructiferi immutatae. Petala ovalia calycem vix superantia. Stamina 40—50: antherarum loculi lineares. Stylus elongatus, stigma acutum.—Panicula magna, terminalis.

1. *V. Indica*, Linn. Wight et Arn., l. c.

II. ISAUXIS.

Calycis lacinia ovatae acutae, fructiferi grandefactae. Petala falcata, calyce triplo longiora. Stamina 15: antherarum loculi oblongi. Stylus brevis, stigma clavatum, 3—6-dentatum.—Paniculae axillares, folio breviores.

2. *V. lanceolata* (Roxb.); foliis lanceolatis basi acutis. *Roxb. Fl. Ind.* ii. p. 601.

Hab. in Silhet.

3. *V. Roxburghiana* (Wight Mss.); foliis oblongis basi retusis vel obtusis. *Wight, Cat.* n. 2448.

Hab. in Malabar, *Wight*.

XVII.—*On the Goniatites found in the Transition Formations of the Rhine.* By M. ERNEST BEYRICH.

[With Plates.]

[Continued from p. 20.]

Section IV. IRREGULARES.

THE dorsal lobe simple, infundibuliform. Two or more pointed lateral lobes, generally infundibuliform, increasing irregularly.

7. *Ammonites Hæninghausi*, Von Buch.

L. Von Buch Goniat. p. 40. Pl. II. fig. 2.

The dorsal lobe is somewhat broader than deep, the dorsal saddle angulose; there are two lateral lobes; the first is linguiform and twice the depth of the dorsal lobe. The first lateral saddle is narrow and elevated much higher than the dorsal

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saddle. The second lateral lobe is but half the depth of the first; the second lateral saddle scarcely reaches the height of the dorsal saddle, and declines strongly towards the suture. The increase in height is 0·51; the increase in breadth 0·55. Nearly half the interior whorls are enveloped.

Besides the fragment in the Museum of Bonn, there is a more complete and better preserved specimen of this ammonite to be found in the collection of Dr. Hassbach of Bensberg. According to his assertion, it came from the transition limestone near the quarry (Steinbreche) not far from Bensberg, that is to say, from a limestone identical with that of the Eifel.

8. *Ammonites multiseptatus*, Von Buch.

L. Von Buch Goniat. p. 42. Pl. II. fig. 13.

The dorsal lobe is small, its breadth and depth nearly equal. Of the four lateral lobes the first is three times the depth of the dorsal lobe, the second is the deepest, the third and fourth are smaller, and there is the commencement of a fifth. The lateral saddles as well as the dorsal saddle are broad and rounded; the second of them is most elevated. The increase in height is 0·53; the increase in breadth 0·48. There are fifty-six chambers in one whorl.

Of this ammonite, which is well characterized by the form of the lobes and number of the chambers, we know at present only a fragment in the Museum at Bonn. It is changed into pyrites, and may very probably belong to the transition limestone of the Eifel, where pyritose fossils often occur.

9. *Ammonites multilobatus*, n. s. Pl. I. fig. 9.

Upon the flat and smooth side are six and sometimes even seven lateral pointed lobes; the first five from the back become gradually deeper; the fifth is the deepest; after that follows a sixth, much smaller, and probably also a seventh. The lateral saddles are pointed; the fifth is the most elevated. The form is discoid, the back very narrow, and rounded off at its junction with the flat sides. On account of the number of lobes and the great difference of form between this and all the other *Goniatites*, I have thought it right to establish it as a species, though I possess but an insignificant fragment from

saddle. The second lateral lobe is but half the depth of the first; the second lateral saddle scarcely reaches the height of the dorsal saddle, and declines strongly towards the suture. The increase in height is 0·51; the increase in breadth 0·55. Nearly half the interior whorls are enveloped.

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the red limestone of the Oberscheld. Neither the increase of the height or breadth can be determined from this fragment, the breadth of the side upon the portion of the fragment preserved, amounts to nearly an inch and a half, so that this ammonite must have been of very considerable size. The fourth dorsal saddle is situated nearly at the middle of the side.

The following Goniatites belong to the fourth section; they are from the Fichtelgebirge, *A. contiguus*, *A. speciosus*, *A. subarmatus*, and *A. spurius*, Münster, probably also *A. maximus*, of which the lobes are not yet known.

Section V. PRIMORDIALES.

The dorsal lobe is divided. There is but one lateral lobe, which is generally rounded; more rarely pointed, its ventral side is raised quite to the suture, without bending itself round to form a lateral saddle.

10. *Ammonites æquabilis*, n. s. Pl. II. fig. 1. *a*, *b*.

The dorsal lobe is more than twice as broad as it is deep. The two sides in consequence rise very gradually to the dorsal saddle. The middle elevation which separates the two divisions of the dorsal lobe is rounded above, does not even attain half the height, and is somewhat hollowed near the siphuncle. The dorsal saddle is broad and rounded, and extends forward as far as the middle of the side; the lateral lobe is nearly as broad as the dorsal saddle and descends somewhat deeper than half the height of the dorsal lobe; its ventral side ascends rapidly towards the suture, to an equal height with the dorsal saddle. The increase in height is 0·7, the increase in breadth 0·75. The number of whorls is from five to six, half the innermost ones being enveloped. The height increases more slowly in this ammonite than is generally the case with Goniatites. The breadth also increases slowly, so that the form is very discoid. The outer whorls are but little elevated above the inner ones, which are nearly half enveloped; on this account they lie together, forming almost an even surface. The greatest thickness is at the middle of the side, which abates gradually towards the back and towards the suture. The back is rounded; the shell thick, presenting faint

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traces of striæ. This ammonite is found with the *Goniatites* of the red limestone at Sessacker near Oberscheld.

11. *Ammonites carinatus*, n. s. Pl. I. fig. 11. *a*, *b*, *c*.

The dorsal lobe is nearly three times as broad as it is deep, consequently the two sides rise very gradually to the dorsal saddle, the middle elevation of the dorsal lobe is broad, rounded above, and reaches to about half the height of the lobe. The dorsal saddle is very broad and rounded, and reaches much beyond half the side. The lateral lobe rounded below rises towards the suture, but only to about half the height of the dorsal saddle. The increase in height is 0.45, the increase in breadth 0.57. There are five or six whorls, the inner whorls being almost wholly enveloped, leaving a narrow and deep umbilicus.

The lobes of this ammonite present a great resemblance to those of the preceding species with which it occurs. The only difference is, that in consequence of the still greater breadth of the dorsal lobe and dorsal saddle the latter extends further over the side, and the ventral wall of the lateral lobe is less raised towards the suture. The last character may arise from the inner whorls being here more strongly involuted, and in consequence a part of the lateral lobe may be compressed by the suture above. The septa of the chambers are hollowed to form a straight and deep ventral lobe at the part where they come in contact with the back of the preceding whorl. This ventral lobe is accompanied by two broad and smooth auxiliary lobes, which occupy the side of the preceding whorl, in the part which is enveloped. The greatest thickness is near the suture, from whence the side very gradually declines towards the back. On the middle of the back, if the shell is preserved, a small elevated ridge is visible, which is unusual in the *Goniatites*, and can only be produced by the siphuncle, situated immediately beneath the shell. This ridge cannot be seen if the shell is wanting, nor is it found on the unchambered part of the shell; on that part the back is altogether rounded.

In the specimen represented the unchambered part is entirely wanting. The complete ammonite is many inches in diameter. The shell thick and almost quite smooth.

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The dorsal lobe is nearly three times as broad as it is deep, consequently the two sides rise very gradually to the dorsal saddle, the middle elevation of the dorsal lobe is broad, rounded above, and reaches to about half the height of the lobe. The dorsal saddle is very broad and rounded, and reaches much beyond half the side. The lateral lobe rounded below rises towards the suture, but only to about half the height of the dorsal saddle. The increase in height is 0.45, the increase in breadth 0.57. There are five or six whorls, the inner whorls being almost wholly enveloped, leaving a narrow and deep umbilicus.

The lobes of this ammonite present a great resemblance to those of the preceding species with which it occurs. The only difference is, that in consequence of the still greater breadth of the dorsal lobe and dorsal saddle the latter extends further over the side, and the ventral wall of the lateral lobe is less raised towards the suture. The last character may arise from the inner whorls being here more strongly involuted, and in consequence a part of the lateral lobe may be compressed by the suture above. The septa of the chambers are hollowed to form a straight and deep ventral lobe at the part where they come in contact with the back of the preceding whorl. This ventral lobe is accompanied by two broad and smooth auxiliary lobes, which occupy the side of the preceding whorl, in the part which is enveloped. The greatest thickness is near the suture, from whence the side very gradually declines towards the back. On the middle of the back, if the shell is preserved, a small elevated ridge is visible, which is unusual in the *Goniatites*, and can only be produced by the siphuncle, situated immediately beneath the shell. This ridge cannot be seen if the shell is wanting, nor is it found on the unchambered part of the shell; on that part the back is altogether rounded.

In the specimen represented the unchambered part is entirely wanting. The complete ammonite is many inches in diameter. The shell thick and almost quite smooth.

12. *Ammonites intumescens*, n. s. Pl. II. fig. 2, a, b, c.

The dorsal lobe is rather less broad than deep, the sides ascending rapidly to the dorsal saddle. The elevation in the middle reaches to at least half the height of the lobe. The dorsal saddle has much greater height than breadth, occupies the middle of the side, and declines rapidly towards the lateral lobe; this is almost as deep as the dorsal lobe, is angulose, and its ventral side raised, at first rapidly and afterwards more gradually, towards the suture, almost to half the height of the dorsal lobe. The increase in height is 0.45, the increase in breadth 0.5. Of the five or six whorls the inner ones are almost wholly enveloped, so that only a narrow and deep umbilicus remains. This ammonite is found with the two preceding at Sessacker, near Obersheld. In its form it bears some resemblance to *A. carinatus*; it is, however, thicker and less discoid, for with a similar increase in height it has more rapid increase in breadth. The lobes moreover sufficiently distinguish it. The greatest thickness is found towards the suture, the sides decline somewhat rapidly towards the back. The unchambered part is wanting in the specimen represented. The complete ammonite must have a diameter of at least four inches.

13. *Ammonites orbiculus*, n. s. Pl. I. fig. 12, a, b.

The dorsal lobe is twice as broad as it is deep, and its sides gradually ascend to the dorsal saddle. The middle elevation reaches to half the height. The dorsal saddle is broad and rounded, and occupies at least three-fourths of the side; its breadth is greater than its height. The lateral lobe is angulose, and almost the same depth as the dorsal lobe; its ventral side wall ascends towards the suture, but only reaches to about half the height of the dorsal saddle. The increase in height is 0.47, the increase in breadth 0.56. The inner whorls are almost entirely enveloped, forming a narrow and deep umbilicus.

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14. *Ammonites calculiformis*, n. s. Pl. II. fig. 3, *a*, *b*, *c*.

The dorsal lobe is almost as broad as deep, its sides ascend rapidly to the dorsal saddle. The middle elevation does not reach one fourth the height of the lobe. The dorsal saddle is broad, rounded, and occupies half the side. The lateral lobe is also greatly rounded, and does not reach the third part of the depth of the dorsal lobe. Its ventral side ascends towards the suture nearly to the height of the dorsal saddle. The increase in height is 0.5, the increase in breadth 0.57. There are five or six whorls, the inner ones entirely disengaged. This ammonite is found with the *Goniatites* of the red limestone of Sessacker, near Obersheld. From its form it might be taken for a *Clymenia*, rather than a *Goniatite*. In the inner whorls the flattened back forms a right or rather a sharp angle with the side, from the greatest thickness being immediately near the back, and the side descending to form an inclined surface somewhat concave from the back to the suture. The back is singularly excavated, so that a wide shallow furrow runs along it. On the last whorl but one the back is broader than the side. The sides of all the whorls are entirely exposed. Neither the sharp ridge formed by the back and side nor the furrow on the former appear in the last unchambered whorl. In this part the back is completely rounded, and the greatest thickness found in the middle of the side, rendering the section of the mouth very nearly circular. The shell is thin and very elegantly striated upon the last whorl, the striæ forming on the side and on the back a smooth curve directed backward. We must further remark that in this ammonite there is a deep ventral lobe, which sinks into the back of the preceding whorl, unaccompanied by the auxiliary lobes on either side. Among the species already described only the

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A. primordialis, Schl., belongs to this fifth section. It occurs with other species partly appertaining to this section in the transition limestone of the Hartz, near Grund; strata which have great resemblance to the limestone of the Eifel, if not altogether identical with it. As the limestone of the Goniatices of Oberscheld is probably yet more recent than the limestone of the Eifel, it appears that we may lay down this rule, that the Goniatices of this section belong only to the recent transition limestone in the neighbourhood of the carboniferous limestone. Notwithstanding the great analogy that exists between the lobes of this and those of the following section, it is interesting to perceive that we can establish for the Goniatices of the carboniferous system a difference in the lobes not very important, but nevertheless very constant.

Section VI. CARBONARIUM.

The dorsal lobe is divided, only a single, lateral, angulose lobe, and one lateral saddle, large and rounded.

15. *Ammonites sphaericus*, Mart.

A. carbonarius, Goldf., *L. von Buch Goniatices*, p. 44. Pl. II. fig. 9 to 9^{iv}.

The dorsal lobe is about as broad as deep. The middle elevation does not reach half the height of the lobe. The dorsal saddle, as well as the two saddles of the middle elevation, form, in uniting above, an obtuse angle. The lateral lobe is single, small, not much deeper than the dorsal lobe, but has rather more breadth than depth. The lateral saddle inclines very gradually towards the suture; it is as high as the dorsal saddle and broader than the lateral lobe. The increase in height is 0.65 to 0.72, the increase in breadth 0.7. There are fourteen chambers in one whorl. The inner whorls are almost entirely enveloped, leaving an umbilicus of greater or less circumference.

Between the *A. sphaericus*, Mart., and *A. carbonarius*, Goldf., there is no specific difference with regard to the form or the lobes. One may observe all the gradations from the spherical form to those with a large and deep umbilicus. If there is a difference in the two, it is only to be sought in the quality of the shell and in the great number of the folds, which in *A. car-*

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16. *Ammonites Listeri*, Mart. Pl. I. fig. 13, a, b.

The dorsal lobe is nearly equal in breadth and depth. The middle elevation attains half the height of the lobe: the two saddles are rounded, as is also the dorsal saddle; the lateral lobe is nearly as deep as the dorsal lobe; it has, like the last, its two arms sloping towards the lower part, in the form of a tongue. The back, which is broad and rounded, forms a sharp ridge with the side, which descends rapidly towards the interior, and cuts across the lateral saddle in the middle. This latter is of the same height as the dorsal saddle. The increase in height is 0.72, the increase in breadth 0.62. There are sixteen to eighteen chambers in one whorl. The inner whorls are strictly enveloped, even to the ridge which is between the back and the side, so that the sides form a large and deep infundibuliform umbilicus. On the back are large and elevated folds. *A. Listeri*, as it is figured Pl. I. fig. 13, is met with at Choquier in the aluminous schist supervening on the carboniferous limestone; it is found in rounded kidney-shaped masses, inclosed by the aluminous schist, which is almost entirely composed of ammonites. I am not at present aware that it has been found in the carboniferous limestone of the Rhine. With this ammonite the *A. Diadema* and *A. atratus*, Goldf., are also found at Choquier. In these the form of the lobes is entirely similar. The peculiar characteristic of *A.*

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16. *Ammonites Listeri*, Mart. Pl. I. fig. 13, a, b.

The dorsal lobe is nearly equal in breadth and depth. The middle elevation attains half the height of the lobe: the two saddles are rounded, as is also the dorsal saddle; the lateral lobe is nearly as deep as the dorsal lobe; it has, like the last, its two arms sloping towards the lower part, in the form of a tongue. The back, which is broad and rounded, forms a sharp ridge with the side, which descends rapidly towards the interior, and cuts across the lateral saddle in the middle. This latter is of the same height as the dorsal saddle. The increase in height is 0.72, the increase in breadth 0.62. There are sixteen to eighteen chambers in one whorl. The inner whorls are strictly enveloped, even to the ridge which is between the back and the side, so that the sides form a large and deep infundibuliform umbilicus. On the back are large and elevated folds. *A. Listeri*, as it is figured Pl. I. fig. 13, is met with at Choquier in the aluminous schist supervening on the carboniferous limestone; it is found in rounded kidney-shaped masses, inclosed by the aluminous schist, which is almost entirely composed of ammonites. I am not at present aware that it has been found in the carboniferous limestone of the Rhine. With this ammonite the *A. Diadema* and *A. atratus*, Goldf., are also found at Choquier. In these the form of the lobes is entirely similar. The peculiar characteristic of *A.*

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Listeri is the sharp ridge, which must be regarded as the limit between the broad back and side, and which intersects the lateral saddle at the centre. The ridges of the shell are strong and simple on the inner whorls; on the outer they become finer and finer, and are bifurcated at the commencement of the back. They are always perceptible as ribs even upon the casts. The folds are raised upon the dorsal ridge in the form of scales, so that it appears indented; and this is well described by the *series marginalis tuberculorum* that Martin gives in his characteristic. The number of ridges upon the third or fourth whorl is about thirty or forty. Their number rapidly augments in the last whorls. A remarkable and very interesting fact is, that upon the outer whorls the folds change their direction altogether. Upon the inner whorls, contrary to the general rule for *Goniatites*, they form a curve upon the back, of which the convexity is directed forward. This curve becomes more and more flattened, the folds keep for some time in a straight line, and at last resume the ordinary direction. The change in the direction of the folds is figured, Pl. II. fig. 8. It proves that no great importance should be attached to the direction of the striæ or folds of the shell in separating the *Goniatites* from the rest of the *Ammonites*.

17. *Ammonites Diadema*, Goldf. Pl. II. fig. 5, 6, 7.

The dorsal lobe is nearly equal in breadth and height. The middle elevation is rounded like the dorsal saddle. The lateral lobe is almost as deep as the dorsal lobe and somewhat sloped in the form of a tongue. The lateral saddle is broad and rounded, and declines gradually towards the suture. The increase in height is 3.52; the increase in breadth 0.62 to 0.65. The inner whorls are almost entirely enveloped, leaving a narrow and deep umbilicus. The form is rather discoid than globular; the shell finely folded. The name which Goldfuss has chosen for this ammonite may have been occasioned by the smooth furrows, which to the number of four or six upon the circumference of a whorl, run along on the back and side, at nearly equal distances. The direction of these furrows entirely follows that of the plications of the shell, notwithstand-

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ing which they are only visible on the casts, being completely filled up by the shell. The shell is very delicately plicated on the outer whorls; the folds are but little raised, and leave very indistinct traces on the casts. They become certainly stronger on the inner whorls, without however being much elevated. The direction of the folds changes as described above, but the change commences further back, and we must retrograde at least one entire whorl to perceive it. The *A. Diadema*, as here represented, appears to differ totally from *A. Listeri* in the form and structure of the shell, yet we ought not to consider these ammonites as two different species, if we would rigorously follow the principle of uniting all those which are connected by a continuous passage. In fact all possible varieties of passage may be observed in these two ammonites; they are determined by the variations which arise in the increase in height and the increase in breadth, characters of great constancy in the *Goniatites*, but which here vary between very distant limits. The increase in height for *A. Listeri* is estimated at 0·72; it is a very gradual increase. For *A. Diadema* it is 0·52: these are the two extremes. The increase in breadth remains nearly equal in both. The passage of the form of *A. Listeri* into *A. Diadema* is influenced thus: by following the continually rapid increase in height the breadth of the back diminishes, and in consequence the ridge, which is perceived as forming the limit between the back and side, appears less and less evident. According as the back becomes more straight, and the sides which begin to appear become larger, the umbilicus is narrowed and the plications of the shell become at the same time more numerous.

18. *Ammonites atratus*, Gold. Pl. II. fig. 8. *a*, *b*.

The dorsal lobe is a little wider than deep, the middle elevation reaches half the height of the lobe and is rounded, as is also the dorsal saddle. In the lateral lobe the breadth and depth are equal, the lateral saddle attains the same height as the dorsal saddle, and declines but little towards the suture. The increase in height is 0·4; the increase in breadth 0·55. The inner whorls are completely enveloped without umbilicus. This ammonite is found with the two preceding at

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XVIII—Remarks on the Reproductive Organs of the Lichens.

By GEORGE DICKIE, Esq., A.L.S., Lecturer on Botany at Aberdeen.

STARCH seems to be a product of almost universal occurrence in the vegetable kingdom; it is found in stems, roots, &c.; and in the parts of fructification of many plants, it is abundant, and appears to serve a very important purpose. It is plentiful in the disk of the almond, and Dunal has detected it in the disks of certain species of *Arum*; and it is supposed to undergo a certain change in order to render it fit to afford nourishment to the pollen and young ovules. Its presence in the ripe seed is well known, and its use during germination has been fully established. But starch is not confined to what are called the higher tribes of plants; it is also found in some which are generally allowed to stand low in the scale of vegetables. In 'Mag. Zoology and Botany,' vol. i. p. 382. I have stated that it occurs in the *nucules* of *Chara vulgaris*, and in the bodies, formerly called *capsules*, of *Pilularia globulifera*, in both of which it is also found along with a matter having all the properties of a fixed oil; it also occurs in those pyriform bodies which are found in the axillæ of the leaves of certain species of *Jungermannia*, 'Mag. Zool. and Bot.,' vol. i. p. 592. So that the bodies in the capsules of *Pilularia* are grains of starch and not sporules, and the contents of the anthers (of some authors) of *Jungermannia* consist also of the same substance. The bodies, which are found in the tubes (transversely undulated

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